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Science-Related Topics in School Library Media Periodicals: An Analysis of Electronic Citation Content from 1998-2004

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Improving student achievement in science is a major thrust of current educational policy in the United States. Can US school library media specialists use articles in recommended school library media publications to approach science-related topics in collection development, collaboration, professional learning, and curriculum integration and be effective partners in achieving this educational imperative? Many school library media specialists use professional periodicals to stay current with new resources and learn role-enhancing strategies, but science topics represented a small number of the total citations of these publications. This study used citations in two major subscription periodical databases and analyzed them for selected aspects of frequency. Few citations described articles about collaboration with science teachers and curriculum involvement. Although professional reading can improve service, the findings of this study indicate that the small number of science-related citations were to articles that tended not to promote deeper involvement with science education.

Introduction and Literature Review

Engaging in professional reading by both browsing current periodicals and searching databases is a habit of mind employed by many librarians to stay current with trends and innovations in their field and to gather information about challenges they may face. Results of a survey by Weaver (2002) demonstrated that librarians rely heavily on professional reading for new sources of information about improving their practice; they used only conference attendance more frequently to gain new professional insight. Survey respondents listed browsing new periodicals as well as locating citations to published articles as means of making use of the magazines and journals of library and information services. When this broad spectrum of librarians was asked to list their preferred professional publications, three school library media periodicals ranked among the most popular. Powell, Baker, and Mika (2002), in their study of a survey of research-reading habits, reported that librarians looked on professional reading as an important task, but that they were often frustrated by theoretical rather than practical research in their field. Survey participants mentioned their desire to seek articles that contained immediately useful information presented in a straightforward, jargon-free manner.

Similarly, school library media specialists use professional literature to stay abreast of strategies and resources that support their roles in informa-

tion literacy, school collaboration, leadership, and technology. According to the dominant framework for school library media practice in the United States, *Information Power* (American Association of School Librarians & Association for Educational Communications and Technology [AASL & AECT], 1998), the school library media specialist as a teacher should promote modes of authentic learning among students and educators so that they may acquire knowledge and skills that will enhance their contributions to school and society. As an instructional partner, the school library media specialist should become fluent in the learning community's curriculum goals, as well as seek connections between information literacy and content-related objectives. As an information specialist, the school library media specialist should be knowledgeable about both the structure and presentation of information and about the learning resources that deliver that information and should assist learners to seek and use information proactively, responsibly, and profitably. And as a program administrator, the school library media specialist should ensure adequate access to materials and services for all stakeholders. School librarians develop capacities for these roles through preservice education, professional development, and in-field reading; unfortunately, these development opportunities are not always available in all the curriculum areas school library media specialists must support.

The Relationship Between School Media and Science

Science education is at an important crossroads as science educators look for renewed impetus, or "another Sputnik" (Galley, 2004) in the face of looming federal mandatory science testing requirements for students in grades 3-8 beginning in 2007. Good science teachers and strong school media specialists have been independently linked to student achievement, but no research has examined the two roles in conjunction (Ercegovac, 2003; Sosa, 2000; Whelan, 2004).

Science education and school library media programs do have commonalities that justify an exploration of their link. Both Mardis (in press) and Vassila (2005) explored the relationship between school library media program capabilities and government-mandated science curriculum standards and found considerable overlap and underexploited potential. Science education includes many components that are compatible with *Information Power* (AASL & AECT, 1998) principles and common practices in school library media programs. These primary components are "(1) science processes, (2) scientific knowledge gathered by applying various processes, and (3) values and attitudes undergirding scientific inquiry" (Churton, Cranston-Gingras, & Blair, 1998, p.172).

It is difficult to determine how deeply the philosophies and pedagogical characteristics of science teaching influence media specialists' opportunities to collaborate with science teachers and science teachers' receptivity to collaboration. In the US, more teachers are teaching out-of-

field in science than in any other area of K-12 education (Ellis, 2003; U.S. Department of Education, 2000). Perhaps the lack of experience with science topics combined with the importance of science achievement accounts for teachers' overwhelming reliance on science textbooks (Stern & Roseman, 2004; Ulerick, n.d.). Unfortunately, some material conveyed through textbooks may counter the goals of inquiry-based, constructivist learning (Stern & Roseman) advocated by the *National Science Education Standards* (1996) and related federal initiatives (Ellis, 2003).

Science students could benefit from process-oriented instruction and solid prior knowledge (Churton et al.; Blair, 1998). Science instruction may be implemented without specific instruction to students in the strategies unique to science learning. Many learning problems in science can be traced to lack of background knowledge, inability to contrast new ideas with existing ideas, and inability to devise learning techniques to process scientific information. Teachers and students of science need support to develop replicable mental models of learning (Kracjik, Marx, & Soloway, 1999). Science teachers can gain support through professional development provided by the school district that focuses on curriculum goals and tools for more effective teaching (Supovitz, 2003). Teachers' confidence is further encouraged by collaborative teaching relationships that take place in the classroom, in other school settings (such as the school library), or in informal learning spaces such as museums and field environments (Drayton & Flick, 2000).

Students similarly benefit from extensive learning support. They often need help in the metacognitive processes of inquiry (Novak, 1998), especially in formulating rich questions, in collecting quality and appropriate substantiating evidence, and in clearly communicating results (Abbas, Norris, & Soloway, 2003; Kracjik et al., 1999). Because questioning and the ability to conduct problem-solving processes are essential to science learning (Churton et al., 1998), school library media specialists can support science learning through teaching students information literacy and research skills (McKenzie, 2002). Strong information literacy and research skills support students' learning in authentic means and contexts and can help them develop multiple literacies with data, technologies, and communication media simultaneously (Lemke, 2000).

Ample evidence suggests that reading capabilities are also tied to science achievement. Problems with science learning often stem from problems with reading. Churton et al. (1998) delineated common learning problems associated with science, and three of the five most common difficulties in science learning encountered by students were linked to reading skills. Effective science education is supported by a variety of strategies and media. In line with *Information Power* (AASL & AECT, 1998) principles and goals, effective science learning is composed of a blend of experience with hands-on activities and active engagement with a variety of sources so that students can construct science concepts and knowledge.

Science seems to be a particularly challenging area for school library media specialists. In a national survey of school library media specialists, a team of researchers headed by Holton, Bae, Baldridge, Brown, and Heffron (2004) found that science was an area of infrequent collaboration for school library media specialists. Abilock (2003) pointed out, "Some school librarians whose liberal arts or teacher training programs have provided them with inadequate background in science might feel at a disadvantage teaming with science teachers." Mardis (2005) reported the results of interviews with school library media specialists from Michigan. When asked about their interaction with science teachers and knowledge of science topics, interview participants cited a lack of professional development opportunities to help them gain scientific knowledge and learn specific strategies to support science teachers. Many participants also mentioned feeling inadequately prepared to serve science educators due to their social science and humanities-oriented preservice undergraduate and graduate focuses. Abilock recommended that school librarians keep current with scientific literature and cultivate collaborative relationships with science educators by suggesting new print and electronic resources that might fit existing curricula. In agreement, Valentine (2003) supported the notion of building partnerships with science educators by suggesting that

> Professional journals ... provide ... assistance ideas and activities for the [school library media specialist] ... collaborating on these projects with the science teacher is an excellent way to bring students into the school library media center and help them see its relevance in their science studies. (p. 38)

Professional literature can be a universal source of support. Dillon's (1997) study of teacher-librarians in rural New South Wales, Australia, suggested that the ability to access and make use of professional information was a key part of teacher-librarians' support of classroom teachers, especially in the absence of targeted professional development opportunities.

Awareness of the amount and type of information contained in professional reading is key to determining the ability of school library media literature to provide support for collaboration with science educators. The project described in this article was undertaken to describe and analyze science-related content in the practitioner literature of school librarianship in an effort to determine how well it supports engaging with science teaching and learning. The intent of this study was to examine citation quantities and distributions, not to evaluate the quality or content of articles. To this end, four research questions guided the work.

1. What portion of the school library literature citations refers to articles on science topics?
2. How has the distribution and type of citations changed during the scope of the study?
3. What types of articles are being published about science in school library literature?
4. What type of school library media roles and activities for science do the literature support?

Methods

Content analysis of citations in two electronic periodical databases was the method used for the study. Content analysis is a research technique used to identify and record aspects of document content systematically and quantitatively (Allen & Reser, 1990; Dimitroff, 1995). Analysis was conducted of citations rather than of the full text of articles because readers in both print and electronic environments use title and/or citation content as the primary determinant of content relevance (Barry, 1994; Fitzgerald & Galloway, 2003; Park, 1993; Wang & Soergel, 1998).

Periodical Selection

The first step of the strategy was to select school library periodicals widely known to school library media specialists in the US. Both the American Association of School Librarians (AASL) and a popular Web site for school librarians, School-Libraries.org (http://www.school-libraries.org), provide lists of recommended professional periodicals.

These two lists were narrowed to include titles indexed in databases widely available to school library media specialists in the US. A recent survey conducted by Bell (2005) demonstrated that 43 of 50 states provided free publicly available subscription databases to state residents. An in-depth examination of the contents of 25 state-funded digital libraries in 2003 by Chorney (2004) revisited an earlier self-described "not scientific" (p. 27) study by Pappas (2003) of state virtual libraries. The later study concluded that over half of those examined provided access to the OCLC FirstSearch databases and that these databases comprised those common to the largest number of states (Chorney). I concluded that it was most likely that school library media specialists who did not receive print versions of periodicals would have access to them through the OCLC FirstSearch databases.

Most of the selected periodical titles were indexed in the OCLC FirstSearch periodical database *WilsonSelect Plus*, which uses a detailed citation format with descriptive fields that enhance document description. The citation record fields are not consistently applied to each article, but they do allow for deeper analysis of the citations.

An additional periodical title, *School Library Media Activities Monthly*, was also included in the overall analysis although it is not indexed in *WilsonSelect Plus*. Both the AASL list and the School-Libraries.org lists recommend this periodical; Valentine (2003) described it as a useful source of science activities. *School Library Media Activities Monthly* is indexed in *ArticleFirst*, another OCLC FirstSearch database. *ArticleFirst* also includes citation records with many fields in common with *WilsonSelect Plus*. The final list of periodicals along with their annual circulation rates and abbreviations used in the data presentation of this study are detailed in Table 1.

Table 1
Periodical Titles Used in This Study
With Annual Circulation and Abbreviations

Title	*Annual circulation*	*Abbreviation*
The Book Report*	ND	TBR
Journal of Youth Services In Libraries	7000	JYSL
Knowledge Quest	91,000	KQ
Library Media Connection	20,000	LMC
Media and Methods	50,000	MAM
*Multimedia Schools***	ND	MMS
School Librarian's Workshop	7800	SLWK
School Libraries Worldwide	ND	SLW
School Library Journal	39,500	SLJ
School Library Media Activities Monthly	14,000	SLMA
*School Library Media Research****	Online	SLMR
T.H.E. Journal	170,000	THEJ
Teacher Librarian	10,000	TL
Technology and Learning	83,000	TAL
Voice of Youth Advocates	6000	VOYA

* *In January 2003,* The Book Report *and two other publications not included in this study,* Technology Connection *and* Library Talk,*were merged into a new publication,* Library Media Connection.

** *In January 2004, the title of this publication became* Multimedia Schools and the Internet.

*** *Before 1999, the title of this publication was* School Library Media Quarterly.

Data Collection

The second step of the data collection was to determine the number of total citations listed in the *WilsonSelect Plus* database in select school library periodicals between 1998 and 2004. Boolean search expressions like that shown in Equation 1 were used to retrieve the total number of citations per periodical.

(so: journal w of w youth w services w in w libraries) and (yr: 1998-2004)

The second data-collection task was to obtain the number of citations about science in the selected periodicals. These data were collected using Boolean search expressions like that illustrated in Equation 2.

(so: journal w of w youth w services w in w libraries) and (kw: science) not (kw: political w science or kw: social w science or kw: science w fiction) and (yr: 1998-2004)

The expression depicted in Equation 2 created a result set that included all citations with the keyword *science.* This set was then narrowed by the exclusion of the keyword phrases *political science, science fiction,* and *social science.* These keyword phrases if not excluded would diminish the precision of the search results by including potentially irrelevant concepts.

The data set was further limited to citations from the sources *Journal of Youth Services In Libraries, Knowledge Quest, Media and Methods, Multimedia Schools, School Library Journal, School Library Media Research, School Librarian's Workshop, School Libraries Worldwide, T.H.E. Journal, Teacher Librarian, Voice of Youth Advocates.* Because the intent of this study is to describe the current presence of science-related topics in school media literature, retrieval was limited to citations to articles published between 1998 and 2004. A modification of this same search equation was used to obtain the total number of citations in a given periodical per year.

To retrieve citations about science from the *School Library Media Activities Monthly* indexed in *ArticleFirst*, the Boolean expression shown in Equation 3 was used.

((kw: science) not (kw: "political science" or kw: "science fiction" or kw: "social science")) and (so: "school library media activities monthly") and (yr: 1998-2004)

The expression illustrated above created a result set of citations that included the keyword *science* and for conceptual precision, excluded the keyword phrases *library science, political science,* and *science fiction.* The results set was then narrowed to include only citations from *School Library Media Activities Monthly* between 1998 and 2004.

Table 2
School Media Periodical Titles, Circulation, Date Range, Total Citations and Science Citations 1998-2004

Title	*Citation date range*	*Total citations*	*Science citations*	*Percent science*
TBR	1/98-12/02	1500	44	3%
JYSL	4/98-12/03	624	9	2%
KQ	3/01-12/04	271	18	7%
LMC	1/03-12/04	79	1	1%
MAM	1/98-12/04	500	38	8%
MMS	9/98-12/03	636	55	8%
SLWK	5/99-12/04	536	13	2%
SLW	7/99-7/04	79	3	4%
SLJ	1/98-12/04	4280	257	6%
SLMA	1/98-12/04	344	24	7%
SLMR	1/98-12/03	39	3	8%
THEJ	3/99-12/04	915	55	6%
TL	9/98-12/04	818	22	3%
TAL	6/02-12/04	197	5	3%
VOYA	1/98-12/04	694	13	2%
Total		11512	560	5%

Note: ND denotes that no data were available in the database for that year.

Data Analysis

Citations in the result sets from *WilsonSelect Plus* and *ArticleFirst* were exported to a text file and the content of the text files standardized in an Excel spreadsheet. Standardization ensured that each citation record included the same fields even if the contents of the fields were blank.

Once the citation records were standardized, they were imported into the Statistical Package for the Social Sciences (SPSS) software application. In SPSS, frequency statistics were run on the citation record contents to address each of the research questions. Frequency statistics allowed me to determine how often a particular characteristic was present in the entire data set. Only citation records were included in the described analysis; the complete text of articles was not used in this study.

Results

The results of the analyses are presented below in order of the research questions.

Number of Science-Related Citations

As Table 2 illustrates, the total number of citations indexed from the targeted school library media periodicals between 1998 and 2004 was 11,557, with 5% (492) of those citations about science-related topics.

As illustrated in Table 1, the date ranges for each periodical differ due to publishers' indexing agreements with H.W. Wilson, the producer of *WilsonSelect Plus* and OCLC, the producer of *ArticleFirst*. Therefore, it may be meaningful to focus examinations of frequency to percentages of articles as well as to the sum total of citations.

The largest percentage of science-related articles (8%) were published in *Multimedia Schools* and *School Library Media Research*; the smallest percentage (1%) were published in *Library Media Connection*, probably because it included only two years of citations in the data. The *Journal of Youth Services in Libraries* also had a low percentage of science citations (2%) and slightly over five years of citations included in the data.

Annual Breakdown of Citations

Table 3 displays the breakdown of science citations for each of the years included in the study. Data in this table indicate that the number of science citations peaked in 2000 at 126 and then steadily declined to a low of 43 in 2004. This decline is seen despite the number of publications with citations included in each period. Despite the drop in citations, the proportion has remained the same at 4-5% per year over each of the six years.

Article Types in Science Citations

The citation record fields for *WilsonSelect Plus* includes the field "Article type." Given the wide range and variability of article-type labels used by indexers in this field, it seems to be governed by a con-

Table 3
Total citations (n_y) and science citations (n_s) and per year 1998-2004

	1998		1999		2000		2001		2002		2003		2004	
Title	n_y	n_s	n_y	n_s	n_y	n_s	n_y	n_s	n_y	n_s	n_y	n_s	n_y	n_s
TBR	331	13	432	12	167	5	328	13	242	1				
JYSL	124	5	177	3	120	0	89	1	114	0				
KQ							56	3	80	3	100	11	35	1
LMC											31	0	48	1
MAM	109	6	93	6	93	12	86	5	45	2	35	3	39	4
MMS	77	7	98	7	115	13	121	11	120	11	105	6		
SLWK			49	0	92	0	85	2	102	4	103	2	105	5
SLW			8	0	23	0	15	0	15	0	13	1	5	2
SLJ	352	13	862	59	938	78	963	60	640	29	193	7	332	11
SLMA	0	0	0	0	0	0	0	0	19	2	156	10	169	12
SLMR	12	0	5	0	7	0	6	0	6	1	3	2		
THEJ			160	13	212	14	201	13	124	9	106	2	112	4
TL	77	2	192	8	124	1	115	5	127	4	99	1	84	1
TAL									34	3	93	2	70	0
VOYA	101	2	116	2	113	3	115	1	80	1	90	2	79	2
Total	1183	48	2192	110	2004	126	2180	114	1748	70	1127	49	1078	43

Note. Shaded areas represent years for which no data were available.

trolled vocabulary; a thesaurus of this vocabulary was not available to the database user.

Article type designations were helpful in obtaining an initial understanding of the kinds of science articles that were published during the data set years. OCLC defines the article type designation as "Words or abbreviations that describe the format or medium used to present an article." Without a thesaurus or database provider-supplied definition list for the article-type terms, it is impossible to define the designations strictly. Still, enough consistency seemed to exist in the labels applied to the citations in the data set to use them as an analysis variable.

Most of the citations retrieved from *WilsonSelect Plus* were assigned one article type. Book reviews were not assigned an article type, but included "book review" in the citation. Because reviews of all other types of materials were assigned article types, I assigned "Book review" to citations that were clearly book reviews. A total of seven article types were used in all the citations in the portion of the data set from *WilsonSelect Plus*.

The citations for *School Library Media Activities Monthly*, retrieved from the *ArticleFirst* database, were not assigned an article type in the citation record I assigned each citation one of the seven article types from *WilsonSelect Plus*. The "Article type" designations used were the collection development-related types of "Bibliography," "Book review," "Videotape review," "Product evaluation," and the instructional and professional development types of "Feature article" and "Speech."

The article type of "Bibliography" was assigned to citations to articles that were lists of print materials. An example of a "Bibliography" record is the citation for the article entitled "Science-savvy students, part I" by Janet Dawson Hamilton in the March 2000 issue of *School Library Journal* (pp. 134-135). The abstract for the article included in the citation record reads, "A bibliography of books that support primary-grade science standards in the life sciences, earth sciences, physical sciences, and science and technology is presented."

The article type of "Book review" was assigned to citations to articles that contained reviews of print materials and included the phrase "book review" somewhere in the citation record. An example of a citation for a record of the book review article type is the review for *Exploring Science in the Library* by Joan Hamilton printed in the August 2000 issue of *School Library Journal* (p. 215). Similarly, the "Videotape review" article type described citations to articles that described and evaluated video resources such as Jackie Keith's review of the *Sci-Squad* video in the March/April 2002 of *Book Report* (p. 82). The "Product evaluation" article type was assigned to reviews of material that were not book or video resources. These items included CD-ROMs, Web sites, and databases such as the review for the *Field Trip to the Earth* CD-ROM by Joanne Troutner in the May/June 1999 issue of *Teacher Librarian* (p. 49).

The article type of "Feature article" seemed to denote the most in-depth and substantive articles about science activities and the school library. An example of a record with the article type of feature article is the citation for the article by Janet Scribner entitled "Using Real-Time Weather Data in the Science Classroom," published in the March/April 1998 issue of *Media and Methods* (pp. 26-27). The abstract in the citation record refers to the article's description of student activities using the visualization and computation of weather data.

The final article type of "Speech" was applied to citations to articles that were transcripts of lectures and speeches given at school library media events such as the 1998 Margaret A. Edwards Award acceptance speech given by Madeleine L'Engle reprinted in the fall 1998 issue of the *Journal of Youth Services in Libraries* (pp. 11-13).

As Table 4 indicates, most of the citations (352) were classified as some type of collection development aid. The term "Videotape review" was applied to the most (181) collection development-related citations. The significant non-collection development article type was "Feature article," applied to 200 citations.

Table 4
Article Type Classifications of Science Citations in School Media Periodicals 1998-2004

	Article type					
Title	*Bibliography*	*Book review*	*Feature*	*Product evaluation*	*Speech*	*Videotape review*
TBR	1	4	13	20	0	6
JYSL	3	0	2	0	4	0
KQ	2	0	15	0	1	0
LMC	0	0	1	0	0	0
MAM	0	0	20	11	0	7
MMS	0	2	28	25	0	0
SLWK	1	0	12	0	0	0
SLW	0	0	3	0	0	0
SLMA	0	1	22	1	0	0
SLJ	4	6	34	45	0	165
SLMR	0	0	3	0	0	0
TAL	0	0	4	1	0	0
THEJ	0	0	22	30	0	3
TL	0	0	17	5	0	0
VOYA	7	1	4	1	0	0
Total	18	14	200	139	5	181

Discussion

In response to research question 1, "What portion of the school library literature citations refers to articles on science topics?" the results of these analyses indicate that a small proportion of the articles published in recommended school library media periodicals apply to science topics. And when science topics are addressed, it is predominantly through video reviews, book reviews, and product evaluations. This finding is consistent with both the quantitative and qualitative results of a recent study by Mardis (2005) that reported that the size of the media center's video collection explained 2% of the variance in Michigan middle-school science test achievement and that video was perceived by school library media specialists as a crucial element of their science collection development strategies. The prevalence of collection development supports in professional literature is also consistent with the findings of many studies that school library media specialists most often play the roles of information specialist and program administration in *Information Power* (AASL & AECT, 1998).

The second research question asked, "How has the distribution and type of citations changed during the scope of the study?" The advent of *No Child Left Behind* (NCLB), the US government's wide-ranging elementary and secondary curriculum and instruction reform legislation, also seemed to have little effect on the science content in school media publications. This sweeping legislation implemented in 2001 mandates yearly testing of students in all core subjects, now in reading and mathematics and in science in 2007. It has not had the effect of increasing the number and types of science articles published (it should also be noted that my preliminary results of a similar study of mathematics citations indicates that these comprised about 1% of the material in the same publications). Science citations have remained relatively constant since the implementation of *No Child Left Behind.*

In terms of the final two research questions, "What types of articles are being published about science in school library literature?" and "What type of school library media roles and activities for science do the literature support?" an implication of the results is that school library media periodicals do not as frequently contain strategies to promote or facilitate collaboration with science teachers or offer instructional assistance to them as they support collection development. Indeed, feature articles about science comprised only 200 of 11,512, or slightly fewer than 2%, of the articles published in the last six years. Most of the citations were to collection development-related articles. Although support for both print and electronic collection development in the area of science is useful, and the focus on audiovisual product reviews has the potential to support inquiry-based, diverse learning in science, methods for improving the link between the school media center collection and the school media program and the school's science curriculum remain elusive. Specific strategies to promote collaboration between school library media specialists and science teachers are represented in only about one third of the citations to science-related articles in this study.

This study has limitations. The first and emphatic caution is that the data included in this study represent only one possible source of information about science education and the media center. School library media specialists may obtain information about science from professional organizations, workshops, and other continuing education opportunities; monographic print sources; periodicals absent from the recommended lists; recommended periodicals not indexed in the *WilsonSelect Plus* and *ArticleFirst*; and relationships with colleagues.

Another limitation resides in the fields attached to the citations. Companies with varying categorization schemes produce OCLC FirstSearch databases. Cross-database analysis using the described methodology requires a large amount of human mediation, which increases the likelihood of errors and inconsistencies in handling data. Even when citation field formats are consistent, the database producers do not seem to be using controlled vocabularies to populate some fields. For example, neither the *WilsonSelect Plus* online documentation nor the database descriptions at the H.W. Wilson Web site and the OCLC Web site include references to the controlled vocabularies used in their citation fields.

The conclusions of this study suggest some avenues for future research. Bibliometric characteristics of citations in the data set such as article length could be examined. Certainly future studies could include a larger number of school library media periodicals in the analysis. An analysis could also be extended from citation content to full-text article content. This type of study would allow authors' characteristics and topical content to be examined, thus yielding deeper understanding of the discussion of science in school media literature.

Given the geographic limitations of the study, an avenue for future research could be international comparisons of periodical content included in a variety of internationally available databases.

The methodology described here can be expanded and/or replicated to perform deeper or broader descriptions of the types of resources school library media specialists have readily available for informal professional learning. This study is an early attempt to characterize the content of school library media literature through the analysis of citation content. Even so, the implications of this study suggest that if producers of school library media literature intend to support the roles set out in *Information Power* (AASL & AECT, 1998) and the school curriculum, they may need to seek content aggressively that targets school librarians' collaboration, curriculum, and technology use with science education.

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